



Serial No. 09/910,952

IN THE CLAIMS:

Please CANCEL claims 2, 3, and 15 without prejudice or disclaimer and AMEND claims 4, 10-12, 14, 32, 33, and 37 in accordance with the following:

1-3. (CANCELLED)

4. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:

a positive electrode including an active material including lithium;

a negative electrode having another active material including sulfur; and

an electrolyte disposed between the positive and negative electrodes, the electrolyte comprising:

a first solvent having a dielectric constant that is greater than or equal to 20;

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane~~a second solvent having a viscosity that is less than or equal to 1.3 cP; and~~

an electrolyte salt,

wherein:

the first solvent is between 20% inclusively and ~~30~~40% by volume of the electrolyte, and

the second solvent is roughly between 80% and about 60% by volume of the electrolyte.

5-7. (CANCELLED)

8. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein said electrolyte salt is at least one selected from a group consisting of lithium hexafluorophosphate (LiPF_6), lithium tetrafluoroborate (LiBF_4), lithium hexafluoroarsenate (LiAsF_6), lithium perchlorate (LiClO_4), lithium trifluoromethane sulfonyl imide ($\text{LiN}(\text{CF}_3\text{SO}_2)_2$), and lithium trifluorosulfonate ($\text{CF}_3\text{SO}_3\text{Li}$).

9. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein a concentration of said electrolyte salt is roughly between 0.5 M and 2.0 M.

10. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:

a negative electrode comprising a negative active material selected from a group consisting of lithium metal, lithium-containing alloy, a combination electrode of a lithium/inactive sulfur, a compound that can reversibly intercalate lithium ion, and a compound that can reversibly redoxdate with a lithium ion at a surface;

an electrolyte comprising a first solvent having a dielectric constant that is greater than or equal to 20, a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane~~a second solvent having a viscosity that is less than or equal to 1.3 cP~~, and an electrolyte salt; and

a positive electrode comprising a positive active material comprising at least one sulfur-based material selected from a group consisting of a sulfur element, Li_2S_n ($n \geq 1$), an organic sulfur compound, and a carbon-sulfur polymer $((\text{C}_2\text{S}_x)_n$ where $x=2.5$ to 50 and $n \geq 2$), and an electrically conductive material,

wherein

the first solvent is roughly between 20% and 40% by volume of the electrolyte,
and

the second solvent is roughly between 80% and about 60% by volume of the electrolyte.

11. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:

a positive electrode including an active material including lithium;

a negative electrode including another active material including sulfur; and

an electrolyte disposed between the positive and negative electrodes, the electrolyte comprising

a first solvent having a polarity high enough to dissolve an ionic compound;

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane~~a second solvent having a viscosity that is less than or equal to 1.3 cP~~; and

an electrolyte salt,

wherein

the first solvent is between 20% inclusively and ~~30~~40% by volume of the

electrolyte, and

the second solvent is roughly between 80% and about 60% by volume of the electrolyte.

12. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:
a negative electrode comprising a negative active material including sulfur;
an electrolyte comprising
a first solvent having a polarity high enough to dissolve an ionic compound,
a second solvent selected from a group consisting of methylethyl ketone,
pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene,
fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane~~a second solvent having a~~
~~viscosity that is less than or equal to 1.3 cP, and~~
an electrolyte salt; and
a positive electrode comprising a positive active material including lithium,
wherein
the first solvent is roughly between 20% and 40% by volume of the electrolyte,
and
the second solvent is between ~~70~~60% and 80% inclusively by volume of the electrolyte.

13. (ORIGINAL) The lithium-sulfur battery of claim 12, wherein the first solvent has a dielectric constant that is greater than or equal to 20.

14. (CURRENTLY AMENDED) A lithium-sulfur battery comprising:
a negative electrode comprising a negative active material;
an electrolyte comprising
a first solvent having a polarity high enough to dissolve an ionic compound,
a second solvent selected from a group consisting of methylethyl ketone,
pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene,
fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane~~a second solvent having a~~
~~viscosity that is less than or equal to 1.3 cP, and~~
an electrolyte salt; and
a positive electrode comprising a positive active material,

wherein:

the first solvent is at least one selected from a group consisting of methanol, hexamethyl phosphoramidate, ethanol, and isopropanol,

the first solvent is roughly between 20% and 80% by volume of said electrolyte, and

the second solvent is roughly between 20% and about 80% by volume of said electrolyte.

15. (CANCELLED)

16. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein: the first solvent is roughly between 20% and 40% by volume of said electrolyte, and the second solvent is roughly between 80% and about 60% by volume of said electrolyte.

17. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein a ratio of the first solvent to the second solvent is roughly 1:1.

18-28. (CANCELLED)

29. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein the first solvent is at least one selected from a group consisting of ethylene carbonate, propylene carbonate, dimethyl sulfoxide, sulfolane, γ -butyrolactone, acetonitrile, dimethyl formamide, methanol, hexamethyl phosphoramidate, ethanol, and isopropanol.

30. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 4, wherein the second solvent is at least one selected from a group consisting of methylethyl ketone, pyridine, methyl formate, tetrahydrofuran, diglyme (2-methoxyethyl ether), 1,3-dioxolane, methyl acetate, 2-methyl tetrahydrofuran, ethyl acetate, n-propyl acetate, ethyl propionate, methyl propionate, ethyl ether, diethyl carbonate, methylethyl carbonate, dimethyl carbonate, toluene, fluorotoluene, 1,2-dimethoxy ethane, benzene, fluorobenzene, p-dioxane, and cyclohexane.

31. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 10, wherein said first solvent is at least one selected from a group consisting of methanol, hexamethyl phosphoramidate, ethanol, and isopropanol.

32. (CURRENTLY AMENDED) The lithium-sulfur battery of claim 10, wherein the second solvent is between ~~70~~60% and 80% inclusively by volume of the electrolyte.
33. (CURRENTLY AMENDED) The lithium-sulfur battery of claim 10, wherein the first solvent is between 20% inclusively and ~~30~~40% by volume of the electrolyte.
34. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 10, wherein the second solvent is substantially 80% by volume of the electrolyte.
35. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 10, wherein the first solvent is substantially 20% by volume of the electrolyte.
36. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein the second solvent is between 70% and 80% inclusively by volume of the electrolyte.
37. (CURRENTLY AMENDED) The lithium-sulfur battery of claim 14, wherein the first solvent is between 20% inclusively and ~~30~~40% by volume of the electrolyte.
38. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein the second solvent is substantially 80% by volume of the electrolyte.
39. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein the first solvent is substantially 20% by volume of the electrolyte.
40. (PREVIOUSLY PRESENTED) The lithium-sulfur battery of claim 14, wherein said first solvent is at least one selected from a group consisting of methanol, hexamethyl phosphoramidate, ethanol, and isopropanol.
- 41-42. (CANCELLED)
43. (PREVIOUSLY PRESENTED) An electrolyte for a lithium-sulfur battery having a positive and negative electrode, comprising:
a first solvent having a dielectric constant that is greater than or equal to 20;

a second solvent selected from a group consisting of methylethyl ketone, pyridine, methyl formate, n-propyl acetate, ethyl ether, methylethyl carbonate, toluene, fluorotoluene, benzene, fluorobenzene, p-dioxane, and cyclohexane; and

an electrolyte salt,

wherein:

said first solvent is at least one selected from a group consisting of methanol, hexamethyl phosphoramidate, ethanol, and isopropanol, and

the first solvent is roughly between 20% and 80% by volume of the electrolyte.